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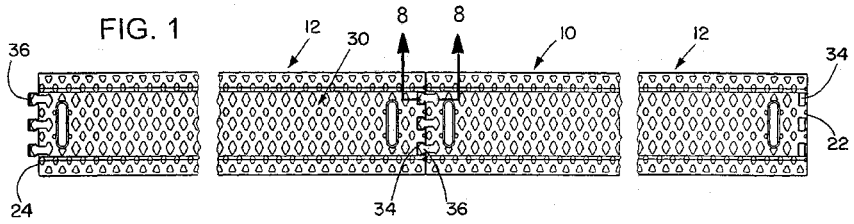
(54) Title: PORTABLE ROADWAY WARNING DEVICE

FIG. 1



(57) Abstract: A portable roadway warning device comprises one or more rumble strips. Each rumble strip comprises at least two interconnected strip sections, each made of a polymeric material. Opposite end edges of the strip sections have respective alternating notches and tabs sized and spaced for engagement with respective tabs and notches on opposite end edges of other of the strip sections to provide a releasable connected joint therebetween. The undersides of the tabs have transverse slots adjacent axial inner ends of the tabs for seated engagement by lower outer cross members extending transversely of the notches adjacent axial outer ends of the notches. The alternating notches and tabs in the respective opposite end edges of the strip sections are dovetailed for dovetailed engagement with one another.

Title: PORTABLE ROADWAY WARNING DEVICE

FIELD OF THE INVENTION

This invention relates generally to a portable roadway warning device comprising any desired number of portable modular rumble strips for use in various roadway conditions to alert drivers of automotive vehicles including both passenger vehicles and trucks of an approaching condition.

BACKGROUND OF THE INVENTION

It is generally known to use portable rumble strips in roadway applications to provide a perceptible noise and warning vibration when automotive vehicles including passenger vehicles and trucks drive over the rumble strips to warn the drivers of an approaching condition such as a work site, construction site, slow speed zone and so on, without alarming the drivers and without adversely affecting the stability of the vehicles. Portable rumble strips should be reusable and quick and easy to apply and remove. Also they should have the ability to remain in place under the desired level of performance, including for example heavy duty relatively high speed applications and/or lighter duty, lower speed applications.

SUMMARY OF THE INVENTION

The above and other benefits and advantages of portable rumble strips are accomplished in accordance with the present invention by providing one or more rumble strips each comprised of a plurality of modular strip sections each having a substantially greater length than width, and top and bottom surfaces, and end and side edges, and each fabricated of a suitable flexible polymeric material such as rubber or polyurethane or other polymeric material with similar properties.

In accordance with one aspect of the invention, each of the modular strip sections has alternating notches and tabs at opposite end edges sized and spaced for engagement with respective tabs and notches on opposite end edges of other strip sections to provide a releasable connected joint between the opposite end edges of the strip sections.

In accordance with another aspect of the invention, the notches at one of the end edges of the strip sections have axial inwardly angled inner end walls for overlapping engagement by axially outwardly angled outer ends of the tabs at the opposite end edge of other strip sections, and undersides of the tabs have transverse slots adjacent axial inner ends of the tabs for seated engagement by lower outer cross members extending transversely of the notches adjacent axial outer ends of the notches for releasably connecting the end edges of the strip sections together both laterally and orthogonally relative to the longitudinal axes of the strip sections.

In accordance with another aspect of the invention, the alternating notches and tabs in the opposite end edges of the strip sections are dovetailed for dovetailed engagement with one another to carry longitudinal loading of the interconnected strip sections when the interconnected strip sections are pulled by one of the end edges longitudinally along the ground.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a fragmentary schematic top plan view of an exemplary portable rumble strip of the present invention which is comprised of a plurality of modular strip sections.

Fig. 2 is an enlarged top plan view of one of the modular strip sections of Fig. 1.

Fig. 3 is a perspective view of the modular strip section of Fig. 2 as seen from the top right end thereof.

Fig. 4 is an enlarged fragmentary longitudinal section through one of the tabs at the left end edge of the modular strip section of Fig. 2, taken on the plane of the line 4-4 thereof.

Fig. 5 is an enlarged fragmentary longitudinal section through one of the notches at the right end edge of the strip section of Fig. 2, taken on the plane of the line 5-5 thereof.

Fig. 6 is an enlarged fragmentary top plan view of the tab and associated end of the strip section of Fig. 4.

Fig. 7 is an enlarged fragmentary top plan view of the notch and associated end of the strip section of Fig. 5.

Fig. 8 is an enlarged fragmentary longitudinal section through the connected end edges of the two strip sections of Fig. 1, taken on the plane of the line 8-8 thereof.

Fig. 9 is an enlarged fragmentary top plan view of the connected end edges of the two strip sections of Fig. 8 as seen from the plane of the line 9-9 thereof.

DETAILED DESCRIPTION OF THE INVENTION

Referring now more particularly to the drawings, wherein the same reference numbers are used to designate like parts, and initially to Fig. 1, there is shown one form of elongated portable rumble strip 10 of the present invention which may be comprised of two or more modular strip sections 12 connected together. Figs. 2 and 3 show one such strip section 12. Each strip section preferably has substantially flat top and bottom surfaces 14 and 16 and opposite side edges 18 and 20 and end edges 22 and 24 (also see Figs. 4, 5 and 9), and is desirably made of a suitable high strength, weather-resistant polymeric material such as rubber or polyurethane or other polymeric material with similar properties.

Although the dimensions of each rumble strip section 12 may vary, each rumble strip section has a width that is preferably between approximately eight inches and approximately sixteen inches and more preferably approximately fourteen inches. Also the rumble strip sections are of sufficient thickness to create a noticeable audible and vibration warning to drivers of automotive vehicles including trucks and passenger vehicles when driven over the rumble strip sections, but not so severe as to alarm the drivers, and without causing adverse effects on the stability of the vehicles. To that end, the rumble strip sections desirably have a thickness of between approximately one-half inch and approximately one inch and more preferably approximately three-quarter inch.

To provide a better grip between the bottom surface 16 of the rumble strip sections 12 and the roadway and to reduce possible skidding of vehicle tires

against the top surface 14 of the rumble strip sections when wet, both the top and bottom surfaces of the rumble strip sections may have texturing 30. Also the texturing may be in the form of an open diamond pattern as schematically shown in Figs. 1-3, to provide a channel effect to permit the escape of water from both underneath and above the strip sections.

Suitable hand grip slots 32 may be provided in each rumble strip section adjacent one or both ends for ease of picking the rumble strip sections up.

One or both side edges 18 and 20 of each rumble strip section may be beveled to help eliminate any possible movement of the rumble strip sections caused by initial contact of the vehicle tires with the rumble strip sections. The included beveled angle of one or both side edges of the rumble strip sections is preferably between approximately 10° and approximately 15° and more preferably approximately 12°. Alternatively, one or both side edges of each rumble strip section may have concave top surfaces to further help eliminate any possible movement of the rumble strip sections caused by initial contact of the vehicle tires with the side edges of the rumble strip sections.

As seen for example in Figs. 1-3, each rumble strip section 12 has alternating notches 34 and tabs 36 at opposite end edges 22 and 24 sized and spaced for overlapping engagement with respective tabs and notches at opposite end edges of other strip sections for connecting the opposite end edges of any desired number of strip sections together to form a rumble strip of any desired length. For example, each of the individual strip sections may have a length of between approximately three and one-half feet and approximately four feet, whereby three strip sections joined together in end to end relation will be of sufficient length to reach across a single highway lane, which is typically eleven feet wide. Each of the individual strip sections may be made somewhat longer or shorter than that or of different lengths if desired. Also more or less than three strip sections may be used to make up a single rumble strip if desired. However, it has been found that strip sections each having a length of between approximately three and one-half feet and approximately four feet can be easily stacked and shipped on pallets with the strip sections lying flat.

The alternating notches 34 and tabs 36 at the opposite end edges of each of the strip sections are sized and spaced for engagement with respective tabs 36 and notches 34 at opposite end edges of other strip sections to provide a

releasable connected joint between the opposite end edges of the strip sections. As best seen in Figs. 4, 5 and 8, the notches 34 at the end edge 22 of the strip sections have axially inwardly angled inner end walls 38 for overlapping engagement by correspondingly axially outwardly angled outer end walls 40 of the tabs 36 at the opposite end edge 24 of each of the strip sections. Preferably the inner end walls 38 of the notches 34 and the outer end walls 40 of the tabs 36 are respectively correspondingly inwardly and outwardly angled over a majority of their height and intersect the bottom surface 16 of the respective strip sections. More preferably, the angled inner end walls 38 of the notches 34 and the outer end walls 40 of the tabs are respectively correspondingly concave and convex over a majority of their height for ease of overlapping engagement with one another.

The undersides 42 of the tabs 36 at the end edge 24 of the strip sections have transverse slots 44 adjacent the axial inner ends of the tabs for seated engagement by lower outer cross members 46 extending transversely of the notches 34 adjacent axial outer ends of the notches at the opposite end edge 22 of other strip sections for releasably retaining the joined end edges of the strip sections together both laterally and orthogonally relative to the longitudinal axes of each of the strip sections as further shown in Figs. 4, 5 and 8. Preferably these lower outer cross members 46 are integrally molded to opposite sides of the notches 34 and are made out of the same polymeric material as the strip sections. Also the lower outer cross members 46 may but need not be reinforced as desired.

Insertion of the cross members 46 adjacent the axial outer ends of the notches 34 in the end edge 22 of other strip sections into the slots 44 in the undersides of the tabs 36 of one of the strip sections may be facilitated by placing the tabs 36 at the end edge 24 of one of the strip sections over the notches 34 in the opposite end edge 22 of another of the strip sections and stepping on the overlying tabs of the one strip section to cause the tabs to cam into the notches in the other strip section and press the slots 44 in the undersides of the tabs over the cross members 46 adjacent the axial outer ends of the notches in the other strip section to cause the overlapping end edges to snap into place as shown in Fig. 8 for releasably connecting the end edges of the strip sections together both laterally and orthogonally relative to the longitudinal axes of the strip sections.

When two or more such modular strip sections are connected together and in place on the ground, the strip sections won't normally come apart. To prevent the strip sections from inadvertently separating from one another if the interconnected strip sections are dragged longitudinally along the ground by pulling one of the end edges of one of the strip sections, the alternating notches 34 and tabs 36 at the opposite end edges of the strip sections have matching dovetailed shapes 54 and 56 for dovetailed engagement with one another as shown in Figs. 1, 6, 7 and 9 to carry longitudinal loading of the interconnected strip sections.

If each rumble strip 10 comprised of two (or more) modular strip sections 12 interconnected together is found not to be heavy enough to remain in place under the desired level of performance, a desired number of laterally spaced, transversely extending ballast/stiffening plates or bars, made for example of steel or cast iron, may be completely or partially embedded in each of the strip sections. Alternatively a plurality of cavities may be provided in the top surface of the strip sections to accept any desired number of plates or bars, or the plates or bars may be mechanically fastened or adhesively affixed to the top surface of the strip sections as desired. Figs. 4, 5 and 8 schematically show such plates or bars 60 embedded within the approximate center of the thickness of the strip sections 12. The plates or bars 60 preferably run transversely across the width of the strip sections to provide stiffness in the transverse direction so the side edges 18 and 20 of the strip sections don't curl in use. The number and spacing of the plates or bars may vary depending on the desired level of performance. For example, the number of plates or bars used may be less for lighter duty, lower speed applications than for heavier duty, higher spaced applications. Also, the thickness of the modular strip sections and required strength of the connections between the interconnected strip sections may be less for lighter duty, lower speed applications than for heavier duty, higher speed applications.

Each of the plates or bars 60 preferably has a width of between approximately one and one-half inch and approximately two and one-half inches and more preferably approximately two inches. Further, each of the plates or bars preferably has a thickness of between approximately one-quarter inch and approximately one-half inch and more preferably approximately three-eighths inch.

The length of the plates or bars 60 may vary depending on the width of the rumble strips. For example, if the rumble strips are approximately thirteen to fourteen inches wide, the plates or bars preferably have a length of between approximately ten inches and approximately eleven inches and more preferably approximately ten and three-eighths inches. If the width of the rumble strips is more or less than that, the length of the metal plates or bars may be proportionately reduced or increased as desired.

Although the invention has been shown and described with respect to certain embodiments, it is obvious that equivalent alterations and modifications will occur to others skilled in the art upon the reading and understanding of the specification. In particular, with regard to the various functions performed by the above-described components, the terms (including any reference to a "means") used to describe such components are intended to correspond, unless otherwise indicated, to any component which performs the specified function of the described component (*e.g.*, that is functionally equivalent), even though not structurally equivalent to the disclosed component which performs the function of the herein illustrated exemplary embodiments of the invention. In addition, while a particular feature of the invention may have been disclosed with respect to only one embodiment, such feature may be combined with one or more other features as may be desired or advantageous to any given or particular application.

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What is claimed is:

1. A portable roadway warning device comprising:

one or more rumble strips,

each rumble strip including a plurality of interconnected strip sections, each of the strip sections being made of a polymeric material,

each of the strip sections having a longitudinal axis, top and bottom surfaces, end edges at opposite ends of the longitudinal axis, and side edges connecting the end edges,

the opposite end edges of each of the strip sections respectively having alternating notches and tabs sized and spaced for engagement with respective tabs and notches on opposite end edges of other of the strip sections to provide a releasable connected joint between the opposite end edges of the strip sections, the tabs extending axially outwardly from the end edges and the notches extending axially inwardly from the end edges,

the notches having axially inwardly angled inner end walls for overlapping engagement by axially outwardly angled outer end walls of the tabs, and undersides of the tabs having transverse slots adjacent axially inner ends of the tabs for seated engagement by lower outer cross members extending transversely of the notches adjacent axially outer ends of the notches for releasably connecting the opposite end edges of the interconnected strip sections together both laterally and orthogonally relative to the longitudinal axis of each of the strip sections, and

the alternating notches and tabs in the respective opposite end edges of the strip sections are dovetailed for dovetailed engagement with one another to carry longitudinal loading of the interconnected strip sections when the interconnected strip sections are pulled by one of the end edges of one of the strip sections longitudinally along the ground.

2. The device of claim 1 wherein the inner end walls of the notches are inwardly angled and the outer end walls of the tabs are outwardly angled over a majority of their respective heights for overlapping engagement with one another.

3. The device of claim 2 wherein the inner end walls of the notches and the outer end walls of the tabs intersect the bottom surface of the respective strip sections.

4. The device of claim 2 wherein the inner end walls of the notches are concave over a majority of their height, and the outer end walls of the tabs are convex over a majority of their height.

5. The device of claim 1 wherein the lower outer cross members are integrally molded to opposite sides of the respective notches adjacent the axial outer ends of the notches.

6. The device of claim 1 wherein the strip sections are made of rubber.

7. The device of claim 1 wherein at least one of the side edges of each of the strip sections is beveled to help eliminate any possible movement of the strip sections caused by initial contact of vehicle tires with the at least one of the side edges.

8. A portable roadway warning device comprising:

one or more rumble strips,

each rumble strip including a plurality of interconnected strip sections, each of the strip sections being made of a polymeric material,

each of the strip sections having a longitudinal axis, top and bottom surfaces, end edges at opposite ends of the longitudinal axis, and side edges connecting the end edges,

the opposite end edges of each of the strip sections respectively having alternating notches and tabs sized and spaced for engagement with respective tabs and notches on opposite end edges of other of the strip sections to provide a releasable connected joint between the opposite end edges of the strip sections,

the notches having axially inwardly angled inner end walls for overlapping engagement by axially outwardly angled outer end walls of the tabs, and undersides of the tabs having transverse slots adjacent axially inner ends of the tabs for seated engagement by lower outer cross members extending transversely of the notches adjacent axially outer ends of the notches, and

the alternating notches and tabs in the respective opposite end edges of the strip sections are dovetailed for dovetailed engagement with one another to carry longitudinal loading of the interconnected strip sections when the interconnected strip sections are pulled by one of the end edges of one of the strip sections longitudinally along the ground.

9. The device of claim 8 wherein the inner end walls of the notches are concave over a majority of their height and the outer end walls of the tabs are convex over a majority of their height for overlapping engagement with one another.

10. The device of claim 9 wherein the inner end walls of the notches and the outer end walls of the tabs intersect the bottom surface of the respective strip sections.

11. The device of claim 9 wherein the lower outer cross members are integrally molded to opposite sides of the respective notches adjacent the axial outer ends of the notches.

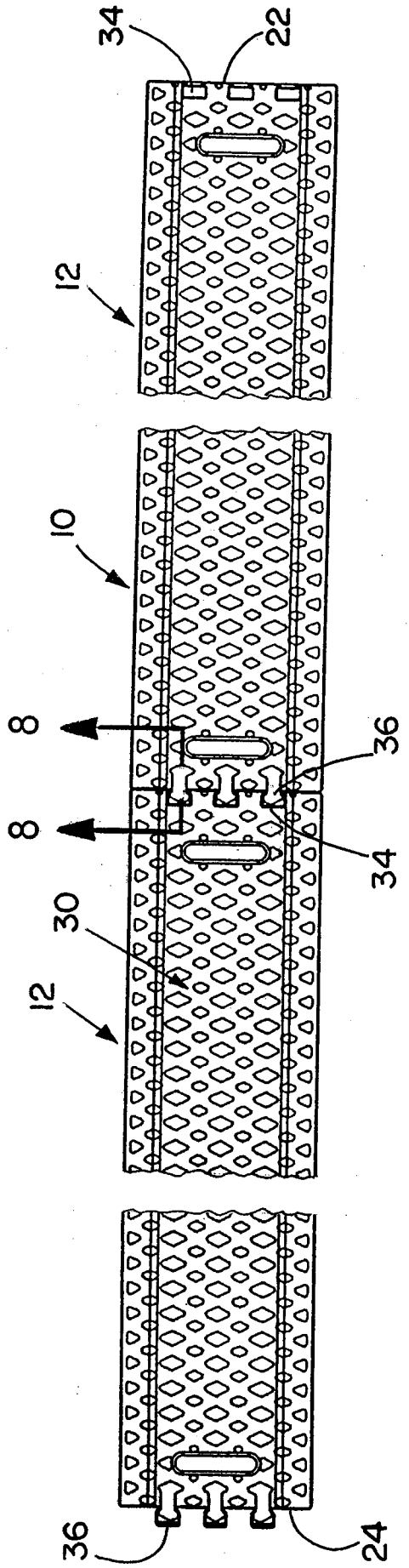

FIG. 1

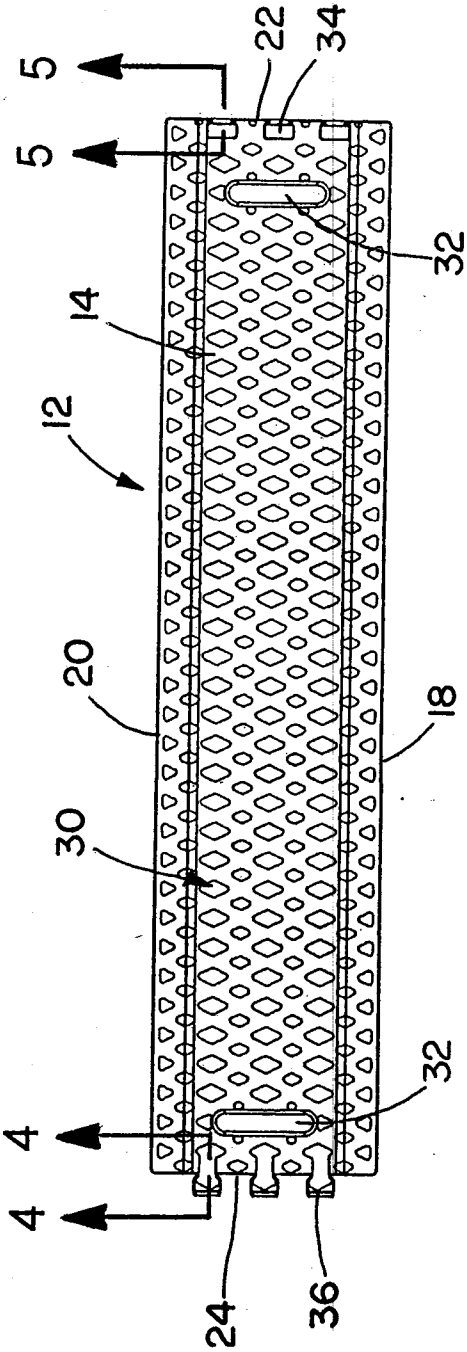

FIG. 2

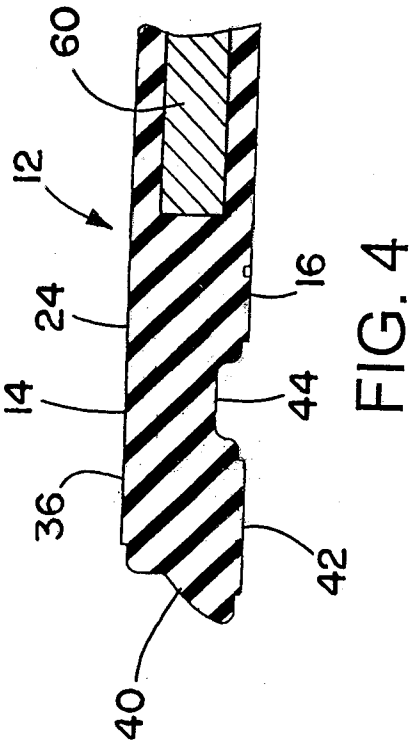

FIG. 4

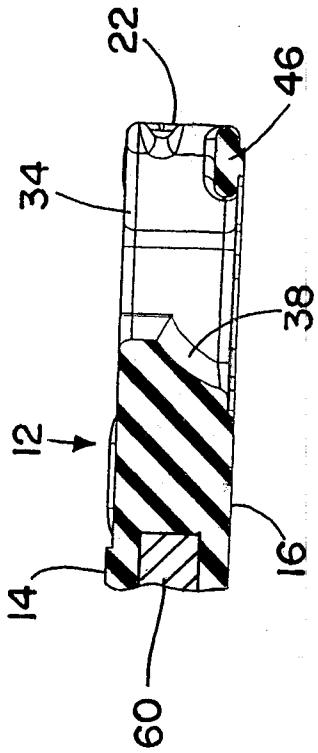

FIG. 5

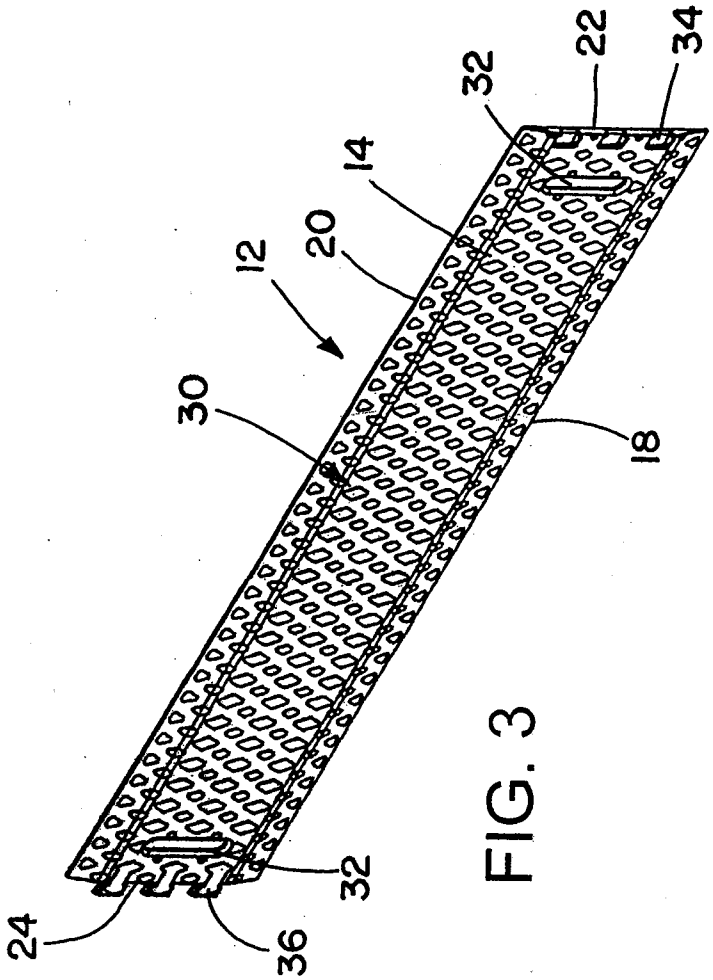

FIG. 3

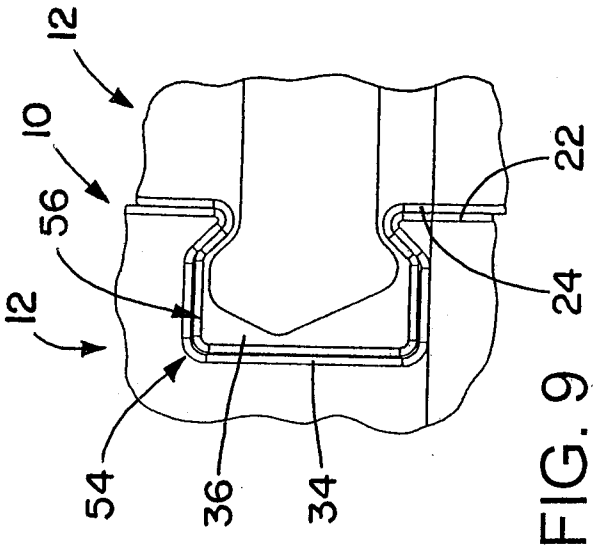

FIG. 9

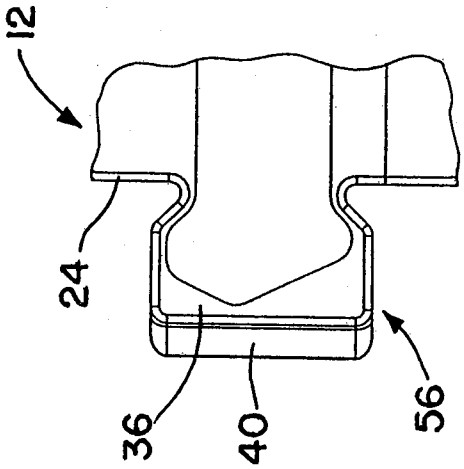

FIG. 6

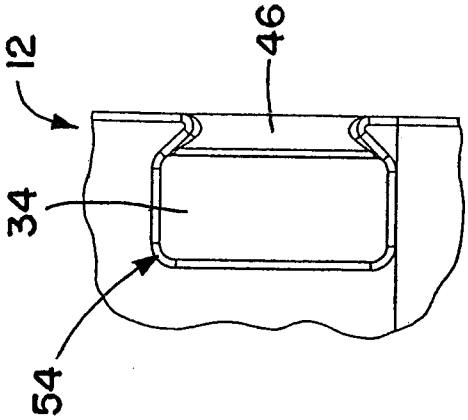

FIG. 7

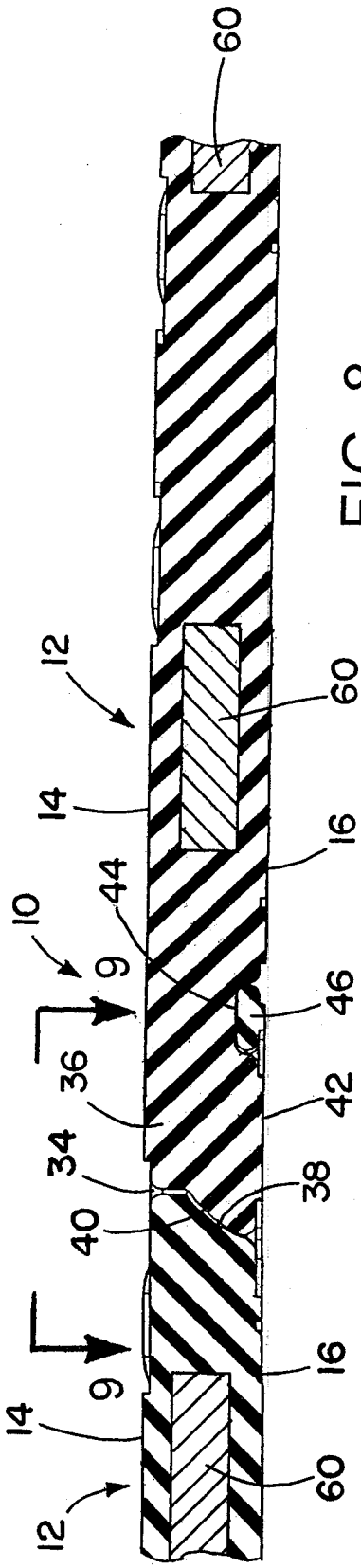

FIG. 8